REMARKS

This amendment is responsive to the Office Action mailed September 21, 2007. Reconsideration and allowance of claims 1-10, 14-16, 18, 20, 22-28, and 30 are requested.

The Status of the Claims

Claims 1-16, 18-28, and 30 were examined in the Office Action mailed September 21, 2007.

Claims 1-6, 8, 9, 13-15, 18, 20, 23, 24, 26-28, and 30 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over by Ashburn, U.S. Pat. No. 6,147,352 (hereinafter, "Ashburn") in view of Gagnon et al., EP1008865A2 (hereinafter, "Gagnon").

Claims 7, 19, 21, and 22 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Ashburn in view of Gagnon in further view of Ishihara, U.S. Pat. No. 5,055,687 (hereinafter "Ishihara").

Claims 10 and 25 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Ashburn in view of Gagnon in further view of Gagnon, U.S. Pat. No. 6,177,675 (hereinafter "Gagnon_675").

Claims 11 and 12 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Marks, U.S. Pat. No. 5,391,877 (hereinafter "Marks") in view of Ashburn in further view of Gagnon.

Claim 16 stands rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Ashburn in view of Gagnon in further view of Balan, Int'l Publ. WO 00/75691 A1 (hereinafter "Balan").

The Claims Distinguish Patentably Over the References of Record

Claim 1 has been amended to specify that the rotatable gantry is a generally circular rotatable gantry defining a gantry rotation axis and an imaging isocenter. This amendment is supported in the original specification at least at page 4 lines 23-31 and by Figs. 3-6 showing circular gantries (12, 12', 12", 12'").

Ashburn discloses a carrier member, which may have a surrounding shell, that carries one or more detector heads. In some embodiments the detector heads may move along a circular arc.

However, the carrier member of Ashburn is expressly taught to be an arcuate member having first and second ends with a gap therebetween. See, e.g., Ashburn col. 3 lines 36-38. This is not a generally circular gantry.

Indeed, Ashburn expressly teaches against using a circular gantry or carrier member. Ashburn discloses that a 180° data collection span is sufficient (Ashburn col. 1 lines 51-53), and accordingly calls for an arcuate carrier member with slightly greater than 180° span (Ashburn col. 5 line 65 to col. 6 line 4, the slight excess beyond 180° providing some oversampling). Ashburn further teaches that the gap is advantageous because it enables easy loading of the subject into the scanner through the gap. See, e.g., Ashburn col. 5 lines 45-49.

Ashburn also discloses, in parallel with the background of the present application, that commercial gamma cameras are generally configured to provide noncircular conformal orbiting of the detector heads:

> [M]anufacturers of commercial gamma cameras allow rotation of their detector heads either through 180 or 360 degrees. In addition, some manufacturers offer the choice of rotations that use an elliptical rather than circular path or orbit. In theory, an elliptical orbit allows the detector to travel in an orbit more closely corresponding to the elongate cross-section of the human torso. Accordingly, the imager head is closer to the patient's heart at all times, and provides better image quality.
>
> Ashburn at col. 1 line 62 to col. 2 line 3.

Finally, Ashburn discloses complete annular rings of radiation detectors:

> There are several gamma camera designs that utilize a single ring or multiple contiguous rings of radiation detectors. However, these imaging cameras are generally intended for brain SPECT and require that the patient lie on a bed or sit in a chair while the ring(s) completely surround the body or organ to be imaged. Therefore, complete ring detector configurations are impractical for SPECT imaging in an acute care setting. Furthermore, they are very heavy instruments and generally require permanent placement in a fixed location.
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> Ashburn col 2 lines 26-36.

There is no suggestion that these contiguous rings of radiation detectors are arranged to orbit the imaging isocenter, much less to circularly and non-conformally orbit the imaging isocenter at the constant fixed radial distance, as called out in claim 1. They appear to be fixed detector rings, similar for example to the fixed detector rings commonly used in PET scanners.

Ashburn is directed to a mobile SPECT system which allows imaging in a preexisting patient environment with little physical disturbance of the patient, which is preferably usable in multiple patient environments in conventional hospital beds or with seated patients, and for acute care settings. See, e.g., Ashburn col. 2 lines 31-33; col. 2 line 65 through col. 3 line 3. For mobile SPECT, Ashburn teaches using an arcuate carrier member having first and second ends with a gap therebetween, and further discloses that the detectors may be moved along a circular orbit. The arcuate carrier member including the gap is what enables Ashburn's mobile SPECT to receive a patient with little physical disturbance, and Ashburn expressly teaches that a detector ring is not suitable for this purpose. The use of circular detector orbiting in such a system is a further compromise – Ashburn recognizes that conformal non-circular orbiting provides better image quality (Ashburn col. 2 lines 1-3), but the goal of Ashburn is a mobile system, and conformal orbiting entails additional complexity and weight that is detrimental to this goal.

Gagnon cannot remedy these deficiencies of Ashburn. As already addressed by Applicants in previous Amendment B, Gagnon affirmatively teaches that the detectors can move "radially toward and away from the imaging region" that is, conformally orbit, the subject during imaging. See, e.g., Gagnon ¶[0039]. In contrast, claim 1 calls for a gamma detector arranged on the generally circular rotating gantry at a constant fixed radial distance from the imaging isocenter.

The skilled artisan designing a mobile SPECT might, based on Ashburn, use an arcuate carrier member with a gap in conjunction with fixed detector radius. The skilled artisan would not consider using a circular gantry for a mobile SPECT, because Ashburn expressly teaches against this.

On the other hand, the skilled artisan designing a fixed SPECT system might elect to use a ring gantry, but would find no motivation to place the detectors at

fixed radial positions. To the contrary, the skilled artisan would learn from Ashburn that conformal orbiting provides better imaging quality, and would also find Gagnon calling for mounting detectors to be movable radially.

In sum, the skilled artisan would find no motivation in Ashburn, Gagnon, or their combination, to design a nuclear camera including both a generally circular rotatable gantry and a gamma detector arranged on the circular rotating gantry at a constant fixed radial distance from the imaging isocenter to circularly and non-conformally orbit the imaging isocenter at the constant fixed radial distance. To the contrary, the skilled artisan would be taught away from this combination either because (in the case of a mobile SPECT) Ashburn teaches an arcuate carrier member with a gap, rather than a circular carrier member, or (in the case of a fixed SPECT) both Ashburn and Gagnon teach providing an adjustable radial position for the detector in order to enable conformal orbiting of the subject to improve image quality.

Claim 14 has been placed into independent form and amended to call for an optically opaque toroidal housing (support in the original specification at least at page 4 line 25). Claim 14 calls for a generally circular rotatable gantry and a toroidal housing. Ashburn discloses an arcuate carrier member. Claim 14 calls for at least four SPECT radiation detectors rotatably arranged around an imaging region to receive emission radiation, the radiation detectors each disposed an equal constant fixed distance from an imaging isocenter. Ashburn discloses two detector heads arranged in its arcuate housing spanning just over 180^0. Gagnon discloses the possibility of four or even more detector heads, but does not disclose or fairly suggest such detector heads each disposed an equal constant fixed distance from an imaging isocenter. To the contrary, Gagnon discloses that the detector heads are mounted to the gantry so as to be movable radially toward and away from the imaging region. Gagnon ¶[0039].

Claim 18 has been amended to incorporate the subject matter of canceled claim 19, and to call for the orbiting to rotate each of a plurality of detectors to common locations M times, where M is an integer greater than one, and the collimator and radiation sensitive array are spun one of 180^0/M and 360^0/M at each location. Claim 19 was rejected based on a trivial example in which M=1. As described in the present application at page 10 line 31 to page 11 line 16 and with reference to Fig. 4, the underlying conceptual recognition is that when each angular position is visited by

two or more detectors over the gantry rotation, this repetition can be used to reduce the rotation span of the collimator and radiation-sensitive array of each detector. In Fig. 4, for example, M=6 and so the collimator and radiation-sensitive array of each detector can be spun only $360^{\circ}/6 = 60^{\circ}$, which enables use of a linear arm actuator. The trivial example of the Office Action does not meet the limitations of claim 18, and claim 18 is not obvious from this trivial example since the example does not recognize the advantageous reduction in collimator/detector array rotation span that is achievable in the method of claim 18.

Claim 26 is amended to call for a circular rotatable gantry defining a gantry rotation axis and an imaging isocenter, and three or more gamma detectors arranged on the circular rotatable gantry at a fixed radial distance from the imaging isocenter. The carrier member of Ashburn is arcuate with a gap, not circular. Gagnon discloses a gantry which appears to be annular without a gap, but the detectors are mounted movable radially toward and away from the imaging region, i.e. at a variable rather than fixed radial distance. The proposed combination of Ashburn and Gagnon to yield a circular gantry with detectors arranged thereon at a fixed radial distance is not an obvious combination, because Ashburn teaches against omitting the gap in the case of a mobile system, whereas for a fixed system Ashburn and Gagnon teach mounting the detectors at a variable distance to enable conformal orbiting to improve imaging quality.

Claim 28 calls for an imaging apparatus including at least four SPECT radiation detectors rotatably arranged around an imaging region, each detector disposed at an equal fixed and non-adjustable distance from an imaging isocenter, such that each detector can rotate completely around the imaging region while being fixed at the fixed and non-adjustable distance from the imaging isocenter, wherein each detector includes: a slat collimator, wherein at least one of collimator slat spacing and collimator height are selected to provide a predetermined resolution at said fixed distance; and a detector width selected to provide a predetermined radiation detection sensitivity at said fixed distance.

The detectors of Ashburn cannot rotate completely around the imaging region, but rather are constrained by the arcuate carrier member to rotation of just over 180°. Gagnon discloses a gantry which enables complete rotation around the

imaging region, but Gagnon's detectors are mounted movable radially toward and away from the imaging region, and hence are not at a fixed and non-adjustable distance from the imaging isocenter. The proposed combination of Ashburn and Gagnon is not viable because Ashburn teaches against having detectors that can rotate completely around the imaging region in the case of a mobile imaging system, while Ashburn and Gagnon teach mounting the detectors at a variable distance to enable conformal orbiting to improve imaging quality in the case of a fixed imaging system.

For at least the foregoing reasons, it is respectfully submitted that claims 1-10, 14-16, 18, 20, 22-28, and 30 patentably distinguish over the references. Applicants therefore ask for allowance of claims 1-10, 14-16, 18, 20, 22-28, and 30.

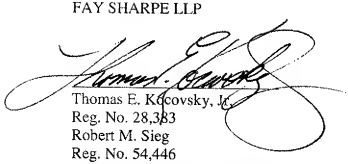
CONCLUSION

For the reasons set forth above, it is submitted that claims 1-10, 14-16, 18, 20, 22-28, and 30 distinguish patentably over the references of record and meet all statutory requirements. An early allowance of all claims is requested.

In the event that personal contact is deemed advantageous to the disposition of this case, the Examiner is requested to telephone the undersigned at (216) 861-5582.

Respectfully submitted,

FAY SHARPE LLP



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